

**Effectiveness of School-based, Peer-led Sexual Health Interventions in Increasing Stis/hiv Knowledge Amongst Adolescents: a Systematic Review**

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**ABSTRACT**

**Background**

The spread of sexually transmitted infections (STIs) including HIV and early pregnancy among adolescents have become public health problems in many settings. School-based, peer-led sexual health education aimed at addressing these issues is extremely important. This systematic review assesses the effectiveness of school-based, peer-led interventions in increasing STIs and/or HIV-related knowledge amongst adolescents in low- middle- and high-income countries.

**Methods**

A systematic search of English literature was conducted on 5th and 6th July 2017. The following databases were searched: PubMed, ERIC and the Cochrane. A hand search of reference lists was also conducted. Eight studies were selected for the systematic review. Inclusion criteria were: studies investigating peer-led interventions for adolescents in a school setting in which the main or one of the components was the improvement of knowledge regarding STIs and HIV/AIDS, and studies that made use of a comparison group.

**Results**

Six out of eight included studies showed significant effects on the targeted outcome 'knowledge', whereas one intervention showed no effects at all and one intervention only showed partial success in terms of the increase of knowledge. Interventions varied widely, and the selection criteria used to recruit peer educators and their training have a major influence on the effectiveness of the interventions.

## **Conclusions**

School-based, peer-led education on STIs/HIV and early pregnancy prevention has shown to be effective in terms of increasing level of knowledge. Factors of success identified in this review were the use of selection criteria to recruit peer educators and the amount of training peer educators received. This study's findings indicate the need for intervention development or policy making focusing on increasing the quality of peer-education methods by adequately recruiting peer educators and providing them with sufficient training..

**Keywords:** School-based, Peer-led Sexual Health Interventions, STIs/HIV Knowledge, Adolescents, low-, middle- and high-income countries

## **INTRODUCTION**

Adolescence is the time when most young people become sexually active and initiate partnered sexual activity (1). This has often resulted in the spread of sexually transmitted infections (STIs) including HIV among them. Some of STIs especially in case of non-detection and hence leaving these infections untreated can have long-term consequences, including infertility and even life threatening or life restricting (2). Another consequence is early pregnancy among teenagers (3).

Risky sexual behaviour or engagement in unprotected sex with multiple sex partners has been identified as the main contributor for the high prevalence of STIs including HIV amongst adolescents and young adults (2, 4). Adolescents' low HIV self-perceived risk is reported to lead to failure or delaying in seeking seek care and getting tested (5, 6). Partners' disapproval of condom use and the perceptions that condoms reduce sexual pleasure are other factors supportive of non-condom use among adolescents (2, 7, 8). Another factor reported to also influence condom use behaviour among adolescents is peer norm. Studies have shown that oftentimes peer norms have negative effects on safe sex practices, and promote unsafe sexual behaviour and thus encourage risk (9, 10). Since peers greatly influence the behaviour of adolescents, peer education is often seen as a meaningful strategy that could positively influence behaviour. Previous studies have shown that peer-led interventions have had different effects. This review solely includes interventions conducted at schools because school-based interventions have the potential to reach large numbers of members of the target group or adolescents (11). Moreover, a school setting generally offers multiple resources, which can be of advantage for particular interventions. These could be resources such as learning utensils, matters for visualisation, and other technical devices, which are usually not available in home settings or community settings. Unavailability of these resources can influence the effectiveness or the main outcome measure of interventions (12). School-settings are more adjustable towards the requirements of particular interventions since the entire environment is regulated by the school board (13).

This review will solely focus on the increase of knowledge as outcome. A lack of knowledge about STIs and/or HIV puts adolescents at higher risk (11). The Health Belief Model identifies knowledge as an important modifying factor and a prerequisite for behaviour change (14). Sexual health education increases knowledge upon which young people make decisions about sexual behaviour (11). Therefore, the aim of this review is to provide an overview of the effectiveness of school-based, peer-led interventions on increasing STIs and/or HIV-related knowledge amongst adolescent students in low-, middle- and high-income countries. This review includes randomized control trials, quasi experimental- and control studies.

The evaluation of the effectiveness of school-based, peer-led interventions in increasing STIs/HIV knowledge among adolescent students is therefore necessary to provide evidence that can be used to inform appropriate practices and policies. This review aimed to answer the following research question: Do school-based, peer led interventions increase STIs/HIV-related knowledge amongst adolescent students?

### **Peer Education**

Through school-based STI and HIV/AIDS programs, peer educators inform and encourage other students (peers) to recognize their risk and protect themselves from contracting STIs and/or HIV. The goal of peer education is to make prevention of STIs and HIV a peer norm (15). Through discussion between peers, new norms about sexual behaviour and relations are able to evolve (16). They serve as credible and positive models for adolescents. According to the Social Learning Theory by Bandura, modelling is an extremely important factor in the learning process. Adolescents learn through observing behaviour of models and adopt similar behaviour (17). Adolescents are more likely to discuss sexual practices with peers than with authority figures such as teachers. Furthermore, peer education provides opportunities to share experiences and knowledge about sexual practices in an understandable and accessible language to adolescents (18).

### **Previous Research**

Several systematic reviews about the effectiveness of peer-led education on the prevention of STIs and/or HIV/AIDS have been conducted. The review by Medley, Kennedy, O'Reilly and Sweat (19) has reported that peer education interventions were moderately effective in increasing HIV-related knowledge and condom use, but showed no significant impact on STIs (19). This review solely included interventions conducted in developing countries, and included several different target groups such as youth, commercial sex workers, prisoners and injection drug users. This review did not focus on one particular setting.

The review of Kim and Free did not find any clear evidence that the peer-led interventions led to an increase of condom use or reducing the odds of pregnancy or having a new partner (20). However, the review did find positive effects on measures of knowledge, attitudes and intentions in most of the studies (20). This review included interventions conducted between 1998 and 2005 in any setting, in high-, middle- or low-income countries.

Another systematic review conducted by Tolli (21) did not find clear evidence of the effectiveness of peer education for young people concerning HIV prevention, adolescent pregnancy prevention and sexual health promotion. This review solely included interventions conducted in Europe, and did not include any restrictions on the setting of the interventions (21). These previous reviews included studies conducted in multiple settings and for multiple target groups, and therefore a review that solely includes studies conducted in a particular setting and for a particular target group is necessary.

## **Methods**

### **Literature Search**

A systematic literature searching on English publications between 2005 and 2016 was conducted on the 5th and 6th of July 2017. The following databases were systematically searched: PubMed, ERIC and the Cochrane. The following search terms were used: ‘STD’ or ‘STI’ or ‘Sexually transmitted disease’ or ‘Sexually transmitted infection’ or ‘Venereal disease’ or ‘Genital disease’ or ‘HIV’ and ‘Intervention’ and ‘School-based’ or ‘School setting’ or ‘Secondary school’. This search was further limited to adolescent age (13-18 years), and English language only.

### **Selection Criteria**

Inclusion criteria were: studies that investigated peer-led interventions for adolescents in a school setting in which the main or one of the components was the improvement of knowledge regarding STIs and/or HIV/AIDS; and only studies that made use of a comparison group were included because by using a comparison group, interventions can be compared and the effectiveness of interventions can be measured. There were no restrictions on study duration and follow-up period because these varied greatly between interventions. Exclusion criteria were: studies that investigated interventions that were not peer-led or interventions that took place outside the school-setting, interventions without comparison groups; studies that were conducted before 2005; studies that were not written in English; and studies that did not include knowledge as an outcome. The reviewers reviewed titles and abstracts on eligibility, and subsequently evaluated the full texts of the residual articles using the established inclusion and exclusion

criteria. Differences between reviewers were resolved through discussions. Figure 1 shows the study selection process that was conducted.

**Table 1 – Inclusion and exclusion criteria (PICOS)**

**Data Extraction**

The articles that met the inclusion criteria underwent data extraction by the reviewers to determine which parts of the results of the included studies were of particular relevance to our research question and the rationale of the review. Data extraction form was developed by consulting the data abstraction guide of Zaza et al. (22), which provides information on which data are important to extract. The abstraction of information about key characteristics of the intervention, characteristics of the study population and other characteristics of the study is essential in order to be able to compare the selected interventions and their outcomes adequately and draw conclusions on their effectiveness. Therefore, detailed information about the following characteristics of the studies was extracted: the country where an intervention was implemented, study design, setting, size and characteristics of the study population, comparison group, the targeted outcome and instruments used to measure this outcome. Furthermore, detailed information about the characteristics of the interventions or specific program components such as lesson plans and frequency of delivery of lessons, was extracted. Detailed information about the characteristics of the peer educators and selection criteria used to select these peer educators, was abstracted. The studies were heterogeneous and varied, among others, in study design, sample size, selection criteria of the peer educators, time frame and measurement of effects .

In table 2, an extensive overview of the characteristics of the interventions is provided. In table 4, a detailed overview of the results of the studies is presented. This table includes the statistical analyses used to measure the outcome, the covariates that were used, and the statistics and results of the outcome.



Table 2 – Data Abstraction

Study	Country, design and setting	Sample	Intervention	Control	Peer educators	Targeted outcomes	Instrument
Morales, A. <i>et al.</i> , 2014	Spain; cluster-randomized controlled trial; school.	832 Spanish scholars aged 14-18. Mean age: 15.72 years	COMPAS programme (Spanish acronym for Skills for Adolescents with Healthy Sexuality), a school-based HIV prevention programme based on developing skills during five weekly one-hour long sessions. The peer's role consisted of delivering the classroom intervention as instructed in the facilitator's manual. An expert assigned to every peer attended the sessions to make sure that the programme was implemented appropriately, and gave clarifications or explanations, when needed. Lesson plan: 1. information and cognitive restructuring; 2. social skills training; 3. problem solving training; 4. maintenance strategies: self-management; 5. covert behaviour rehearsal. Participatory methods, such as interactive activities, games in groups, role-playing, and mixedgender discussion groups, are used.	Intervention arm: 1. COMPAS delivered by experts only 2. COMPAS delivered by experts and peers Control arm: control group that was not exposed to any intervention	Five first-year university psychology students, selected through interviews; mean age 18.5 years. Selection criteria: aged between 17 and 19 years old; possessing good communication skills; having a youthful-looking physical appearance. Ten hours of training.	HIV knowledge	Questionnaire before and after intervention HIV Knowledge Scale for Adolescents was used to measure knowledge regarding the effects of HIV and its transmission by means of ten statements with three optional answers for each: True, False, or I don't know. The score the respondent could obtain ranged from 0 to 10. Examples of statements were, 'HIV is transmitted through vaginal and seminal secretions and blood', and 'HIV is transmitted through the air'. The internal consistency was adequate ( $\alpha$ 0.71).
Huang, H. <i>et al.</i> , 2008	China; quasi-experimental design; school	3068 Senior students aged 15-19 years	The intervention is carried out by peers, classroom-based, consisted of one session per week for four weeks, and emphasized on the basic knowledge towards HIV/AIDS, STDs, and related skills. Lesson plan: 1. increase knowledge about the transmission and prevention of HIV; 2. improve behaviour and behaviour intentions to abstinence and build life skills; 3. eliminate prejudice and stigmatization towards people living with HIV/AIDS.	Intervention arm: peer-led HIV/AIDS prevention group Control arm: control group received usual teacher-led health education curriculum	Forty-six peer educators, aged 16.4-17.7 years old, selected by teachers and verified in an interview with experts. Selection criteria: charismatic personality, credibility, ability in communicating and establishing relationship with the other students, and good school performance. Four day training.	Knowledge on reproductive health, STDs and HIV/AIDS	Self-administered questionnaire before and after the intervention. The questionnaire entails 41 questions on knowledge of reproductive health, STDs and HIV/AIDS to which the students can respond with yes, no or not sure
Cartagena, R.G. <i>et al.</i> , 2006	Mongolia; quasi-experimental design; school	1367 Grade ten student aged 15-19 years	The intervention is carried out by peers, class-based, emphasized on knowledge of HIV/AIDS, STDs, and the promotion of life skills, for a period of 3 years. Lesson plan: 1) Reproductive health; 2) AIDS and STI transmission, symptoms and prevention; 3) Safe sex including how to use condoms; 4) Discussions and interactive communication through skills-based learning about emotions, refusal skills, love, friendship.	Intervention arm: Sexual health peer education program Control arm: Students of the same age group and grade who attended a school without the program	Students, chosen by local GTZ coordinators and teachers. Selection criteria: openness, student interest, intelligence (grades), expressiveness, communication skills, and friendliness. Three days of training.	Knowledge regarding STIs and HIV/AIDS	Self-administered questionnaire. The KAP survey contained 38 questions on knowledge (including identification of STI symptoms and methods of transmission and protection)
Jennings, J.M. <i>et al.</i> , 2013	United States; quasi-experimental, matched comparison group design; school	157 high school students	Teen Prevention Education Program (Teen PEP), a peer-led sexuality education program designed to prevent unintended pregnancy and sexually transmitted infections (STIs) including HIV. Teen PEP is implemented in high schools as a health course and carried out by peers.	Intervention arm: Teen PEP program Control arm: Not stated whether or not control group received a sexual education program	15-20 junior/senior students representative of the student body, recruited by Trained Teen PEP adult advisors. Selection criteria: team worker, leadership potential, communication skills, motivated. 140 hours of training.	Knowledge	Baseline and 12-month follow-up surveys (self-administered). This study used a 22-item index to measure knowledge of sexual health issues related to how to prevent a pregnancy, prevention of STIs and HIV. Questions included true or false, multiple choice and open-ended questions (e.g. "Place the behaviors below in order of least risky to most risky for getting HIV")
Al-Iryani, B. <i>et al.</i> , 2011	Yemen; quasi-experimental design; school	2510 high school students. Mean age: 17.06 years	School-based peer education intervention that focused on decreasing the level of stigma and discrimination towards people living with HIV and on increasing the knowledge about modes of HIV transmission and prevention. The peer educators used 70 x 50 cm posters, where one of 10 messages about HIV transmission, prevention, and common misconceptions and 2 life skills messages on self-esteem and assertive behaviour were displayed on one poster. Also, peer education sessions were conducted during youth summer activities in the same class-room style. After the end of the second session, participants received leaflets on the 10 messages, as well as hats and T-shirts with a message: "Protect yourself with abstinence and knowledge". The slogan was chosen by the peer educators; the knowledge part referred to the knowledge on condoms and knowledge on avoiding drugs.	Intervention arm: peer-led education HIV prevention Control arm: control group that did not receive the intervention	High school students, selected by school coordinators and school social workers. Selection criteria: having good communication skills, being accepted by classmates, good academic achievement. Ten days (8 hours/day) of training	Knowledge	Self-administered questionnaire. Knowledge about HIV/AIDS transmission and prevention were assessed through 12-items. Three options were available: "Yes", "No", and "Don't Know". The answer to each question was scored 1 for correct and 0 for wrong or don't know answer.

Study	Country, design and setting	Sample	Intervention	Control	Peer educators	Targeted outcomes	Instrument
Stephenson, J., <i>et al.</i> , 2008	England, Cluster Randomised Trial; school	Over 9,000 pupils aged 13-14 y at baseline from 27 representative schools in England	Peer educators, aged 16-17 y, were trained to deliver three 1-h classroom sessions of sex education to 13- to 14-y-old pupils from the same schools. The sessions used participatory learning methods designed to improve the younger pupils' skills in sexual communication and condom use and their knowledge about pregnancy, sexually transmitted infections (STIs), contraception, and local sexual health services.	Intervention arm: peer-led sex education Control arm: Usual teacher-led sex education	All pupils in Year 12 (11th grade, aged 16-17 y) were eligible to be peer educators; those wishing to participate did not have to meet any selection criteria	Knowledge about pregnancy, STIs, contraception, and local sexual health services.	Questionnaires at baseline and at approximately 6 and 18 mo after intervention  Third follow-up questionnaire completed at approximately 54 mo after baseline
Massey, P.M., & Preli, M., 2012	Senegal, Pretest/posttest quasixperimental design; school	School A: 4,000 students from all neighborhoods in Dakar School B had 2,500 students and was located in a lower income suburb. School C: private school with 1,500 students School D (comparison school) --> located 18 miles outside of the city; more than 1,000 students	Creation and maintenance of peer-led, school-based clubs in schools that would engage fellow students in raising awareness of HIV with the aim of increasing HIV testing. Clubs were used to provide a sustained, youth-focused space to create original video, audio, and print messages regarding HIV. Members of the clubs created songs, videos, journalistic articles, and other types of media that promoted knowledge and dialogue related to HIV/AIDS, as well as encouraged peers to get tested.	Intervention arm: peer-led sex education Control arm: Comparison school with no intervention	Fifteen student leaders from each school (totaling 45) participated	Knowledge of a place to receive HIV testing;	Data was collected in classrooms through a self-administered, paper-and pencil questionnaire that was anonymous and supervised by evaluation staff.
Merakou, K., & Kourea-Kremastinou, J., 2006	Greece Pre- and post-questionnaires; School	702 students (493 from the intervention group and 209 from the control group) aged 15-20 years old	Peer-educational intervention program: - Teen Aids Club. A kiosk where peer educators provided students with information about HIV/AIDS, leaflets, and a question box where students could throw in their questions anonymously - Poster produced by the peer educators was distributed - Peer educators wore hats or t-shirts with a prevention message on it - Peer educators taught classes about HIV/AIDS	Intervention arm: peer-educational program Control arm: the control group did not receive any HIV/AIDS prevention program or counselling during this period of time.	15 students from each school who wished to undertake the peer educator role were selected by the teachers. When there were more than 15 volunteer students, a lottery was used. 60 hours of training.	Knowledge	Questionnaires based on the WHO KABPs model completed by the students of the intervention schools (except the peer educators) and the students of the three control schools, before and after 6 months of the HIV prevention intervention

**Assessment of the Study Design Quality**

The JADAD scale was used to assess the quality of the study design (23). This scale focuses on three items: randomization, double blinding and withdrawals and dropouts. For each of these items, points can be awarded, with a maximum of five points in total. The allocation of points depends on whether or not the study used randomization and double blinding, and on the quality of the description of the methods used to achieve randomization and double blinding. One point can be awarded if a study states the number of withdrawals and dropouts (23).

**Summary Measures and Synthesis of Results**

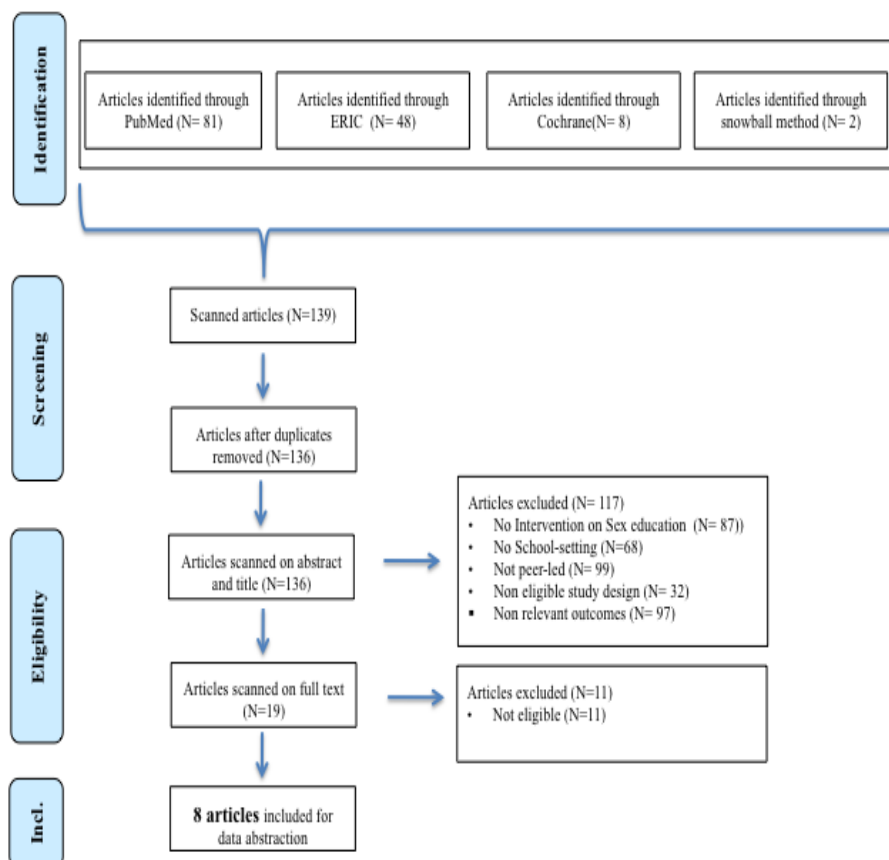
The principal summary measure was a statistically significant difference in knowledge increase amongst the intervention and control groups. For the majority of the included studies, this could only be extracted in the quantity of one measure, whereas for one study different fields of STIs/HIV-related knowledge were assessed and could hence be extracted. Therefore, different areas could be compared individually. There were no effect sizes calculated since the heterogeneity of studies included, as same as the large difference between the countries and hence the cultural backgrounds of the included interventions did make a comparison of effect sizes less meaningful.

**Results**

**Study Selection**

A total of 137 publications were retrieved from databases and two articles were identified through snowball method (Figure 1). After the elimination of duplicates, 136 publications remained. One hundred and seventeen articles did not meet inclusion criteria and were excluded. The full texts of 19 articles were scanned in detail, but 11 articles did not meet the inclusion criteria. Thus, 8 final articles that met all the inclusion criteria remained.

**Figure 1 – PRISMA (Flowchart of the selection process)**



**Characteristics**

The studies were conducted in eight different countries in different continents: Spain, China, Mongolia, United States, Yemen, England, Senegal and Greece. The study population consisted of high school and secondary school adolescent students aged 13 to 20 years old. The study population size varied from 157 to over 9000 participants. The participants were recruited in their schools. In 5 studies, the peer educators were selected based on certain selection criteria (15, 24-27). All of these five studies included good communication skills as selection criterion. Four of them included good school performance as a selection criterion (15, 24-26). Other selection criteria were: having a youthful looking appearance, charismatic personality, credibility, openness, expressiveness, friendliness, team worker, leadership potential, motivated and being accepted by classmates. In one study, there were no selection criteria and all pupils in year 12 who wished to participate were eligible to become peer educators (28). In another study, 15 students per school had to volunteer, and the teachers selected these. If there happened to be more than 15 volunteer students, a lottery was used (29). In the study by Massey and Prelip (30), the process of the selection of peer educators was not discussed. All peer educators received training, but the amount of training varied. The number of hours of training ranged from 10 to 140 hours.

**Intervention Characteristics**

All interventions were conducted in school-based settings and peer-led. The study designs varied. Two of the studies were randomized controlled trials (27, 28). The remaining studies lacked the random assignment and were quasi-experimental designs (15, 24, 26, 29, 30). All interventions had a comparison group. In 7 studies the intervention consisted of two conditions (15, 24-26, 28-30). The intervention group received the peer-led education program. The control group received either the usual teacher-led sexual education program (25, 28) or no sexual education program at all during this period (15, 24, 29, 30) or it was not stated which program, if any, the control group received (26). In one study, there were three conditions (27). The intervention in this study was either carried out by experts only, or by experts and peers.

The duration of the intervention ranged from three one-hour long classroom sessions to 3 years. All but one intervention (30) consisted of classroom based lessons taught by peer educators. These lessons mainly focused on increasing knowledge on STIs and HIV/AIDS, and developing skills. The intervention of Massey and Prelip (30) consisted of the creation and maintenance of peer-led, school-based clubs in schools. The main aim of these clubs was to engage fellow students in raising awareness of HIV and increasing HIV testing. Besides classroom-based lessons, other methods that were used were: the distribution in schools of posters, leaflets, hats and t-shirts with prevention messages on it (15, 29), video and audio messages, songs, journalistic articles (30) and a question box (29). In all interventions, the outcomes were assessed through questionnaires at baseline and after a follow-up period ranging from right after to 54 months after the intervention.

**Quality of the Studies / Strength of Evidence**

The quality of the studies was assessed by using the JADAD-scale. An investigation of the three factors randomization, blinding and participant withdrawal/dropouts was carried out. Overall, the highest score for the quality of studies was reached by the studies by Morales et al. (27) and Stephenson et al. (31) (See table 3). The two studies reached a score of 3. None of the included studies were awarded points for blinding and - except for the two studies already mentioned - no study obtained points for the randomization. All the studies - except the study by Al-Iryani et al. (15), reached a score of 1 earned for the description of participant withdrawal and dropouts. This means that the studies were of low quality.



Table 3 – Quality Assessment

Study	Randomization	Blinding	Participant withdrawal/dropouts	Final score
Morales, A. <i>et al.</i> , 2014	2	0	1	3
Huang, H. <i>et al.</i> , 2008	0	0	1	1
Cartagena, R.G. <i>et al.</i> , 2006	0	0	1	1
Jennings, J.M. <i>et al.</i> , 2013	0	0	1	1
Al-Iryani, B. <i>et al.</i> , 2011	0	0	0	0
Stephenson, J., <i>et al.</i> , 2008	2	0	1	3
Massey, P.M., 2012	0	0	1	1
Merakou, K., 2006	0	0	1	1

### Effect of the Interventions

Only two of the 8 selected studies did not observe significant improvement in knowledge between the intervention and control group (28, 29). The study by Merakou and Kourea-Kremastinou (29) subdivided the outcome measure ‘knowledge’ into different areas of knowledge on sexual health. The results were presented individually and in terms of knowledge regarding sexual transmission of HIV the control group showed more effect in knowledge increase than the intervention group. On general questions regarding the symptomatology of HIV-viruses or the transferability during pregnancy a knowledge-increase in the intervention group and a decrease in the control group was presented. This study also reported a significant increase of subjective knowledge on HIV/AIDS in the intervention group (38.1% at baseline, 49.7% at follow-up), whereas the control group showed a non-statistically significant decrease (54.4 % to 45.5 %). Overall, the level of knowledge of the intervention group in this study did not increase significantly compared to the control group. The study by Stephenson *et al.* (28) did not show significant improvements on the outcome measure ‘knowledge on the emergency contraceptive’ with a weighted odds ratio of 1.10.

The other studies did show a significant improvement of knowledge. Morales *et al.* (27) reported that in the intervention group, HIV-related knowledge significantly increased compared to the control group. However, the intervention conducted by experts only had a higher effect on knowledge measures than the intervention conducted by experts and peers. This shows that the participation of peers as co-facilitators of the intervention did not increase the efficacy of the intervention (27).

The study by Huang and others (25) showed statistically significant increases in HIV/AIDS-related knowledge in the intervention group, but no significant increase in the control group that received the usual teacher-dominated health education. The study by Cartagena *et al.* (24) observed that the intervention group had statistically significantly higher knowledge levels on sexual health than the control group that did not receive the intervention. Al-Iryani and colleagues (15) also supported this conclusion of a positive influence of peer-led interventions. The authors reported that amongst students targeted by peer education, 68% had good knowledge scores, whereas only 43.3% of students not targeted by peer education reached those scores. The effect of the peer education intervention was significant. The students from the intervention group had a statistically higher knowledge score (9.24 out of 12.0) compared to the students from the control group (7.89 out of 12.0), with a reported odds ratio of 2.11. Massey *et al.* (30) measured knowledge about a place to get tested for HIV. This knowledge-related outcome measure increased positively after receiving the peer-led intervention. In the three intervention groups the knowledge score increased by 11.1%, 15.6% and 14.9%, whereas in the comparison group it increased the least by 9.8%. The study by Jennings *et al.* (26) reported that peer educators had significantly higher scores on knowledge compared with the comparison group.

Table 4 - Results

Study	Analyses	Covariates used	Results for outcome	Results/statistics
Morales, A. <i>et al.</i> , 2014	Univariate and multivariate analyses, Cohen's criteria	HIV prevention programme condition led by experts or experts and peers vs. no intervention as control condition	The intervention involving only experts had a higher impact than the experts and peers intervention on HIV knowledge measures. The effect size of the changes indicated a greater positive change in the programme when applied by experts than by experts and peers. The participation of peers as co-facilitators did not increase the efficacy of the programme.	In both intervention groups, COMPAS had a significant positive effect on HIV-related knowledge (F [2, 829] 77.63, p 0.001, η <sup>2</sup> 0.16). Compared to controls, participants who received the intervention significantly increased their HIV knowledge (IGE d 1.06 vs. IGEP d 0.71). After the intervention, the IGE (expert only) scored higher than the IGEP (experts and peers) on total HIV knowledge (d 0.35).
Huang, H. <i>et al.</i> , 2008	t-tests, ANOVA	Peer-led HIV/AIDS prevention condition vs. usual teacher-led health education curriculum as control condition	The peer-led education of HIV/AIDS is more effective in improving knowledge than the usual teacher-dominated health education.	There were statistically significant increases in HIV/AIDS-related knowledge from pre-test to post-test in the intervention group (P, 0.001), but no significant increase was observed in the control groups (including internal and external). Intervention group: pre-test 44.5+19.3; post-test: 66.6+20.2; t-test: 224.542. Internal control group: pre-test: 43.2+19.1; post-test: 43.3+21.3; t-test: 20.048. External control group: pre-test: 45.2+19.5; post-test: 46.1+20.5; t-test: 20.971
Cartagena, R.G. <i>et al.</i> , 2006	Multilevel regression	Sexual health peer education program condition vs. no program as control condition; school factors	The peer education program leads to higher sexual health knowledge levels of students compared to students who do not receive the peer program.	Grade 10 students who attend schools with a peer education program are more knowledgeable in the area of sexual health than grade 10 students from schools without the program (RI 2.43; 95% CI 1.37–4.33)
Jennings, J.M. <i>et al.</i> , 2013	Multiple linear regression	Teen PEP condition vs. control condition Age, knowledge, intentions, clustering of students within schools	Teen PEP peer educators (as compared with the comparison group) had significantly higher scores on knowledge.	Teen PEP peer educators (as compared with the comparison group) had significantly higher scores on knowledge (b 0.13; 95% CI 0.01, 0.25; P value/0.04)
Al-Iryani, B. <i>et al.</i> , 2011	Binary logistic regression analysis; multilevel regression	Peer-led education HIV prevention condition vs. no intervention as control condition Effects of schools	The school-based peer education intervention has succeeded in improving levels of knowledge on modes of transmission and prevention, and in decreasing levels of stigma and discrimination.	Of students targeted by peer education 68% had good knowledge scores, compared with 43.3% of students not targeted by peer education (χ <sup>2</sup> = (df = 1) = 111.15, p < .01). Measuring effects of schools: those targeted by peer education had a higher knowledge score (9.24 out of 12.0) compared with those not targeted (7.89 out of 12.0), OR = 2.11, 95% CI = 1.04-4.27, p = .05)
Stephenson, J., <i>et al.</i> , 2008	Linear and logistic regression	Peer-led sex education (intervention) vs. usual teacher-led sex education	No significant differences between arms for girls or boys in knowledge of the emergency contraceptive pill.	Weighted OR: 1.10 (0.83,1.47) (Unadjusted) / 1.11 (0.86,1.45) (Adjusted)
Massey, P.M., 2012	Univariate analysis	Peer-led sex education condition vs. no intervention as control condition; knowledge of a place to receive HIV testing; fear of getting tested; gender, age, and favorable living conditions; stigma; previous use of computers and the Internet; respondents who reported hearing of the intervention clubs	Respondents from all four schools displayed positive changes between baseline and follow-up in knowing a place to get tested for HIV.	Know place to get tested (No): Model 1, baseline, 2008 (n=1,473): AOR(SE): 2.09 (.31); p-value 0.000 Model2, follow-up, 2010 (n=1,523): AOR(SE): 2.62 (.40); p-value: 0.000
Merakou, K., 2006	χ <sup>2</sup> -test	Peer-led HIV/AIDS prevention education vs. Control group that did not receive any intervention or counselling	Knowledge of the control group regarding sexual transmission of HIV increased more than amongst the intervention group, as the items that HIV is transmitted through seminal fluid, vaginal fluids, and vaginal, anal and oral sex without condom. In items that referred to other general questions such as that HIV carriers have no symptoms or that a pregnant woman can infect her baby, the percentage of correct knowledge in the control group during this year decreased while an increase on the same items was observed in the intervention group. Subjective knowledge about HIV/AIDS amongst the intervention group increased significantly (from 38.1% to 49.7%), while subjective knowledge of the control group decreased during this year (from 54.4% to 45.5%), although this difference was not statistically significant	(1) HIV is the virus that causes AIDS: Intervention group (1997/1998%); p-value 32.7 57.2 <0.001; Control group (1997/1998%); p-value: 31.6 48.3 0.001 (2) HIV carriers have no symptoms: Intervention group (1997/1998%); p-value 61.7 72.2 0.002; Control group (1997/1998%); p-value: 55.5 51.7 0.059 (3) HIV carriers transmit the virus: Intervention group (1997/1998%); p-value: 80.9; Control group (1997/1998%); p-value: 83.4 0.516 79.9 87.6 0.063 (4) A pregnant woman can transmit the HIV to her baby: Intervention group (1997/1998%); p-value 80.9 84.0 0.670; Control group (1997/1998%); p-value: 86.6 85.2 0.559 (5) There is no vaccine against HIV up to now: Intervention group (1997/1998%); p-value: 58.4 65.3 0.019; Control group (1997/1998%); p-value: 58.9 70.8 0.019 (6) HIV is transmitted by blood: Intervention group (1997/1998%); p-value 95.1 96.8; Control group (1997/1998%); p-value: 0.158 90.4 98.6 0.001 (7) HIV is transmitted by seminal fluid: Intervention group (1997/1998%); p-value: 89.7 93.3 0.033; Control group (1997/1998%); p-value: 90.0 97.1 <0.001 (8) HIV is transmitted by vaginal fluids: Intervention group (1997/1998%); p-value 67.5 75.7 0.018; Control group (1997/1998%); p-value: 52.2 72.2 <0.001 (9) HIV is transmitted through vaginal sex without condom: Intervention group (1997/1998%); p-value: 98.2 98.6 0.273; Control group (1997/1998%); p-value: 96.7 97.6 0.838 (10) HIV is transmitted through anal sex without condom: Intervention group (1997/1998%); p-value 72.0 80.5 0.003; Control group (1997/1998%); p-value: 65.1 78.0 0.012 (11) HIV is transmitted through oral sex without condom: Intervention group (1997/1998%); p-value 50.1 50.9 0.247; Control group (1997/1998%); p-value: 45.9 53.6 0.179

## **Discussion**

### **Results on Effectiveness of Peer Education**

The aim of this review is to assess the effectiveness of school-based, peer-led interventions in increasing STIs and/or HIV-related knowledge among adolescent students. This review discusses eight studies that examined this issue. These studies conducted in different countries in different continents. The study designs were mostly quasi-experimental, used pre- and post-intervention questionnaires to assess the outcomes, and included comparison groups. Although the quality of the study designs was generally low, six out of eight studies showed a statistically significant positive effect on knowledge (15, 24-27). The remaining two studies did not show evidence of an increase of the levels of knowledge among adolescents after receiving the intervention (28, 29). These outcomes demonstrate that school-based, peer-led sexual health education can possibly be an effective strategy to increase STIs and/or HIV-related knowledge among adolescents.

Systematic reviews that have previously been conducted on the effectiveness of peer-led, sexual health education interventions have shown mixed results. Two reviews reported positive effects on increasing knowledge (19, 20) but the third review did not find any clear evidence on the effectiveness of peer education (21). These reviews had different inclusion criteria, and were not restricted to the school-based setting or one particular target group. Therefore, they are not fully comparable with this review. The review by Tolli (21) only included interventions that were conducted in Europe, whereas the other two reviews also included interventions conducted in developing countries. This could mean that peer-led interventions might be more effective in developing countries than they are in European countries. More studies are needed to investigate this issue.

With regard to the comparability based on the PICOS criteria it is of relevance to consider that the studies were carried out in eight different countries with different cultural backgrounds (Spain, China, Mongolia, United States, Yemen, England, Senegal and Greece). The characteristics of the study populations were comparable – only students with similar school type and age range were included. But because the populations of the countries where the interventions were conducted significantly differ on many aspects, including cultural differences, the study populations are not wholly comparable. For example, Yemen is a conservative Muslim country and topics such as condom use and sexual health are considered sensitive issues to discuss (15). Whereas in England, topics like these might be less sensitive to discuss. Therefore, it is important to take into account the cultural setting in which an intervention is implemented.

Moreover, the selection and training procedures of the peer educators greatly varied between interventions. The recruitment of peer educators is one of the most important supporting factors

for the effectiveness of the intervention (21). Five out of the eight studies describe the selection criteria used to recruit peer educators, while in the remaining three studies no selection criteria were used or the process was not described at all. Because the peer educators should be credible models and have the adequate personality and skills to support the effectiveness of peer education, not using selection criteria could negatively influence the quality of the intervention (28). Besides, the hours of training that the peer educators received varied widely, which could have affected the effectiveness of the peer education. The two studies that did not find evidence on the increase of knowledge did not use any selection criteria to recruit peer educators (28, 29). Therefore, this review confirms that not including selection criteria for the recruitment of peer educators has a negative impact on the effectiveness of an intervention.

The strength of this review is that it is unique as it focuses on one particular setting, one particular target group, one main outcome, and that it includes interventions that are conducted in low- middle- and high-income countries.

### **Limitations of the Systematic Review**

The limitation of this review is that the measurement of knowledge varied greatly between studies. Some articles measured overall knowledge (15, 24-27), while other articles measured several knowledge items such as knowing where to get tested for HIV or knowledge about the transmission of HIV (29, 30). These differences in measuring knowledge show that the outcomes are not wholly comparable. Knowledge is an important determinant of behaviour change but it does not mean that increased knowledge automatically impacts future behaviour. There are many factors that could influence sexual behaviour of adolescents, and levels of knowledge only give a partial insight on this issue (16). But, knowledge remains a prerequisite for behaviour change and is therefore serves as an important outcome.

Another limitation of this review is the general weakness regarding the quality of the studies. Blinding is almost impossible for these types of interventions because adolescents, their parents and peer-educators need to confirm their consent to partake in the interventions. This may serve as an explanation for the low scoring for blinding during the quality assessment of the included studies. Likewise, randomization appears to be difficult to realize since the interventions are carried out in a classroom setting in which groups are already previously determined.

Other limitations of this review are that it only included publications that were written in English and published in free access journals. This might have led to a publication bias because interventions that do not show changes in outcome are less likely to be published. Another limitation is that effect sizes were not calculated. Effect sizes are a useful way of translating the ‘before and after changes’ in a ‘one group’ situation’ into a standard unit of measurement’ (32).



By not calculating effect sizes, it becomes difficult to translate the meaning of the results reported by different studies. Also, it becomes difficult to measure how big the effects of the interventions actually were, and to compare the effectiveness of the interventions with one another.

### **Conclusions**

This review has shown that school-based, peer-led sexual health education has the potential to be effective and is a promising strategy to increase STIs and/or HIV-related knowledge. In further research, more attention should be given to an adequate implementation of peer-led sexual education. The inclusion criteria for the recruitment of peer educators have shown to greatly influence the effectiveness of an intervention, and it is therefore essential that future interventions take this into account. Moreover, future studies need to focus on behavioural outcomes that actually measure a change in behaviour. This is because non-behavioural outcomes such as knowledge, do not necessarily impact behavioural change. It might not be possible to adequately measure the effectiveness of peer-led education on sexual behaviour by using quantitative measures because sexual behaviour is complex and influenced by many different contextual factors. Using qualitative methods might be a more adequate way of assessing and understanding the complexity behind sexual behaviour, and could therefore serve as a useful tool in future studies (16)

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